

ON THE USE OF DIFFERENCE BANDS FOR MODELING SF₆ ABSORPTION IN THE 10 μ m ATMOSPHERIC WINDOW

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To model correctly the SF₆ atmospheric absorption requires the knowledge of the spectroscopic parameters of all states involved in the numerous hot bands in the 10,5 μ m atmospheric transparency window. However, due to their overlapping, a direct analysis of the hot bands near the 10,5 μ m absorption of SF₆ in the atmospheric window is not possible. It is necessary to use another strategy, gathering information in the far and mid infrared regions on initial and final states to compute the relevant total absorption.

In this talk, we present new results from the analysis of spectra recorded at the AILES beamline at the SOLEIL Synchrotron facility. For these measurements, we used a IFS125HR interferometer combined with the synchrotron radiation in the 100-3200 cm⁻¹ range, coupled to a cryogenic multiple pass cell ^a. The optical path length was varied from 45 to 141m with measuring temperatures between 223 and 153 \pm 5 K. The new information obtained on $\nu_2+\nu_4-\nu_5$, $2\nu_5-\nu_6$ and $\nu_3+\nu_6-\nu_4$ allowed to derive improved parameters for ν_5 , $2\nu_5$ and $\nu_3+\nu_6$. In turn, they are used to model the more important $\nu_3+\nu_5-\nu_5$ and $\nu_3+\nu_6-\nu_6$ hot band contributions. By including these new parameters in the XTDS model ^b, we substantially improved the SF₆ parameters used to model the atmosphere.

^aF. Kwabia Tchana, F. Willaert, X. Landsheere, J. M. Flaud, L. Lago, M. Chapuis, P. Roy, L. Manceron. A new, low temperature long-pass cell for mid-IR to THz Spectroscopy and Synchrotron Radiation Use. Rev. Sci. Inst. 84, 093101, (2013)

^bC. Wenger, V. Boudon, M. Rotger, M. Sanzharov, and J.-P. Champion, "XTDS and SPVIEW: Graphical tools for Analysis and Simulation of High Resolution Molecular Spectra", J. Mol. Spectrosc. 251, 102 (2008)